SECTION 514 -- MICROSURFACING

514.01 -- Description

This work shall consist of an application of microsurfacing material to an existing surface. The microsurfacing material shall be a mixture of latex-modified emulsified asphalt, aggregate, mineral filler, water, and other additives properly proportioned, mixed, and spread.

514.02 -- Material Requirements

1. The asphalt for use in this work shall be Cationic Emulsified Asphalt (CSS-1H). It shall show no separation after thorough mixing and shall conform to the requirements of AASHTO M 208 "Cationic Emulsified Asphalt" except that the requirements for the cement mixing test will be waived. The required properties of CSS-1H are shown in Table 514.01.

Table 514.01

CSS-1H Properties		
Test on Emulsion	**Min.**	**Max.**
Viscosity, Saybolt Furol at 25°C, Sec.	20	100
Storage stability test, one day, percent	---	1
Particle charge test	positive	
Sieve test, percent of emulsion	---	0.1
Distillation:		
Oil distillate, by volume of emulsion, (percent)	---	0.5
Residue, (percent)	62	---
Tests on Residue from Distillation:		
Penetration 25°C, 100 g, 5 seconds	55	90
Softening Point, R. & B.	135°C	---
Viscosity, absolute 60°C, MilliPascal-Seconds	800,000	---

2. a. Mineral aggregate for use in this work shall be gravel conforming to the requirements in Table 514.02.

b. In addition, chat aggregate that is a by-product from the mining of lead and zinc ores shall conform to the gradation requirements shown in Table 514.02. Quartzite or granite conforming to either gradation may be used.

c. The job mix formula shall provide a minimum Marshall stability of 1,850 psi when tested according to NDR T 245. In the event the selection of the aggregate results in a design that fails to meet the stability requirements, either chat aggregate or quartzite and granite may be added to achieve a design meeting the minimum stability requirement. The gradation of any two-aggregate combination shall conform to the requirements of Table 514.02.

Table 514.02

Microsurfacing Gradations	
Chat Gradation	
Sieve Size	**Percent Passing**
3/8 inch	99 - 100
No. 4	86 - 94
No. 10	40 - 60
No. 50	10 - 25
No. 200	5 - 15
Crushed Aggregate Gradation *	
Sieve Size	**Percent Passing**
3/8 inch	100
No. 4	100 - 84
No. 10	64 - 50
No. 60	29 - 13
No. 200	5 - 15
* - Aggregate shall have a minimum fine aggregate angularity of 43%.	
* - Los Angeles Abrasion loss percentage shall not exceed 40.	

3. To limit the amount of clay-like fines in any of the aggregates specified, a sand equivalent value of 60 or higher will be required when tested according to AASHTO T 176.

4. Aggregate shall be sampled and tested at the rate of one sample for each 650 cubic yard. Aggregate shall be sampled and tested in accordance with the requirements shown under the heading "Asphaltic Concrete Materials" in the NDR Material Sampling Guide.

5. The weight of the aggregate shall be measured at the Contractor's stockpile before delivery to the job site. The Contractor must pass the aggregate over a 1/2 inch screen to remove any oversize material. This screening procedure shall occur just before the aggregate enters the mixing unit.

6. Mineral filler for use in this work shall be portland cement, Type I or Type IP, that is free from lumps. Acceptance will be based on visual inspection. The amount of mineral filler needed shall be determined by the laboratory mix design and will be considered as part of the material gradation requirement. An increase or decrease of less than 1 percent may be allowed when the microsurfacing is being placed if it is found necessary for better consistency or set times.

7. Water shall be potable and free of harmful soluble salts.

8. a. The latex-based modifier shall be milled into the asphalt emulsion. This additive will allow the microsurfacing mixture to cure sufficiently to allow normal traffic on the surfaced roadway within 1 hour without damage to the surface.

b. Other additives may be allowed in the mixture or any of the component mixtures to provide the specified properties. Set retarding agents may also be included.

9. a. The Contractor shall be responsible for the design and proportioning of the microsurfacing mixture.

b. Before the production of the mixture, the Contractor shall submit, in writing, a tentative design to the NDR Materials and Tests Engineer at the Central Laboratory for approval.

c. The design shall list all the ingredients of the mixture and their proportions and the gradation of the proposed aggregate.

d. Based on the dry weight of the aggregate, the microsurfacing mixture shall contain:

(1) 6 to 11 percent of residual asphalt.

(2) 0.5 to 3.0 percent of mineral filler.

(3) Latex-based modifier as needed to provide the specified properties.

(4) A sufficient quantity of water to produce a mixture having the proper consistency.

10. a. In the event a combination of aggregates is used, the aggregates shall be mechanically blended before loading the materials into the mixing machine.

b. Blending by loading alternate buckets will not be allowed.

11. Aggregates shall have a soundness loss of not more than 12 percent by weight at the end of 5 cycles using sodium sulfate solution.

514.03 -- Equipment

1. a. The material shall be mixed by a self-propelled continuous-flow mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, and water to a revolving multi-blade mixer and discharge the thoroughly-mixed product on a continuous flow basis.

b. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, and water to maintain an adequate supply to the proportioning controls.

c. The machine shall be equipped with a manufacturer's self-loading device that provides for the loading of all materials while continuing to apply the microsurfacing.

d. The laydown machine shall have opposite side driver stations and operator control of the rate of motion.

2. The controls for proportioning each material shall be accessible for ready calibration. The controls shall be calibrated, properly marked, and located so that the Engineer may determine the amount of each material used at any time.

3. The aggregate feeder to the mixing unit shall be equipped with a revolution counter or similar device.

4. The emulsion pump shall be of the positive displacement type and shall be equipped with a revolution counter or similar device.

5. The mixing unit shall be equipped with an approved fine aggregate feeder that shall deliver a uniform, accurately metered flow of mineral filler. The delivery of mineral filler shall be coordinated with the aggregate feeder flow such that a properly proportioned mixture can be produced.

6. The mixing unit shall be equipped with a water pressure system and nozzle type spray bar to provide a water spray to the roadway surface immediately ahead of the microsurfacing spreading equipment. The pump for dispensing water to the mixing unit shall be equipped with a meter that will register directly in gallons. The pump shall have a minimum of two valves, one of which shall establish the required flow. The other valve shall be the quick acting type and shall be used to start and stop the water flow.

7. A rigid rear screed shall be used on the rut box, and it shall be adjusted to strike off the application of microsurfacing mixture flush with the edges of the rut depressions to the extent possible and within the limits imposed by the maximum aggregate particle size.

8. Approximately 3 feet behind the original strike off shall be a secondary strike off which is cantilevered to the laydown box. It shall have 3 elevation adjustments similar to the primary strike off and be adjustable in width. The secondary strike off shall have a pivot point where it can be tilted for texturing or raised completely off the surface. It shall be equipped with a flying gutter guard that is a flexible squeegee running along the curb line to protect the gutter from microsurfacing material spilling into the curb line. It shall also be flexible at the center to allow for quarter point crown elevation changes.

9. An inside skid shall be attached to the laydown box approximately 1 foot inside both ends of the box and running parallel to the outside skid. The inside skid shall be adjustable in height, allowing the weight of the laydown box to be carried on the inside skid while making adjacent passes.

10. Attached to each end of the distributor box shall be a "drip system" capable of adding a small amount of diluted set-retarding agent into both rear corners. This will help ensure that material being deposited at the longitudinal joint edges has not set before being placed.

514.04 -- Construction Methods

1. The Contractor shall furnish and apply the microsurfacing materials.

2. Immediately before applying the microsurfacing, the Contractor shall clean the surface of all vegetation, loose materials, excess joint material, excess oil, dirt, mud, and other objectionable materials.

3. The Contractor shall water the surface before the application of the microsurfacing. The water shall be applied at a rate such that the entire surface will be damp.

4. The width and rate of application and the methods employed shall result in the rut depressions being completely filled with the least possible application to the remainder of the surface. Depending on the depth of the depressions, more than one application may be required.

5. Areas that cannot be reached with the mixing machine shall be surfaced using hand tools to provide complete and uniform coverage. Such handwork and the machine application shall be completed simultaneously.

6. A sufficient amount of microsurfacing shall always be carried in all parts of the distributor box so that complete coverage is obtained.

7. No lumping, balling, or unmixed aggregate will be allowed. Any oversized aggregate or foreign materials shall be screened from the aggregate before delivery to the microsurfacing mixing machine. No streaks or slick spots shall be left in the finished surface.

8. a. Water used to produce the proper consistency shall be metered.

b. The use of water to routinely clean the box during placement will not be allowed.

9. Microsurfacing mixture shall be placed only when:

a. The atmospheric temperature is 50°F or greater.

b. The temperature is expected to be above 32°F for 24 hours after placement.

c. It is not foggy or rainy.

10. a. Ruts more than 1 inch deep require two applications of microsurfacing.

b. The first pass will bring the ruts up to the level of the existing pavement profile.

c. The second pass will place microsurfacing material over the entire lane.

11. Longitudinal joints shall be placed on lane lines where possible. Joint overlap shall not exceed 3 inches. Care shall be taken to insure straight lines along the roadway centerline, lane lines, and shoulder or curb lines. Lines at intersections shall be kept straight to provide a good appearance.

12. At driveways, intersections, and other locations where sharp turning movements or vehicle accelerations may occur, additional time may be required for adequate curing before allowing traffic on the newly placed material.

514.05 -- Method of Measurement

1. "Aggregate for Microsurfacing" shall be measured by the ton. The weight shall be determined on approved scales under the supervision of the Engineer. Deductions will be made for the moisture in the aggregate at the time it is weighed. Moisture determinations will be made for each of the first 5 loads and as often after that as is necessary to describe the fluctuations in the moisture content.

2. The "Emulsified Asphalt for Microsurfacing" is measured by the gallon. The refinery certified volume shall be used as a basis of measurement for emulsified asphalt if the entire shipment is used.

3. "Mineral Filler for Microsurfacing" shall be measured by the ton of portland cement. If furnished in bags, the weight shall be determined by converting the bag count to tons.

514.06 -- Basis of Payment

1.

Pay Item	**Pay Unit**
Aggregate for Microsurfacing	Ton (Tn)
Emulsified Asphalt for Microsurfacing	Gallon (Gal)
Mineral Filler for Microsurfacing	Ton (Tn)

2. The approved latex-based modifier, other additives, and any additional emulsifying agents will not be measured for payment but shall be considered subsidiary to the item "Emulsified Asphalt for Microsurfacing".

3. Water used in the preparation of the microsurfacing mixture and for prewetting the surface of the roadway will not be measured for payment but shall be considered subsidiary to the item "Emulsified Asphalt for Microsurfacing".

4. When materials do not meet plan and specification requirements, deductions will be made according to Tables 503.01A and B.

5. Payment is full compensation for all work prescribed in this Section.